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数理解析研究所講究録1381

数学解析の理論的展開の計算機による支援・遂行可能性

京都大学数理解析研究所

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Preface

Atsushi Yoshikawa
(the organizer)

This Kôkyûroku is a record of the following research meeting:

Feasibility of Theoretical Arguments of Mathematical Analysis on Computer

held on September 16 – 19, 2003, at the RIMS, Kyoto University. It contains 18 papers, of which 7 are written in Japanese[1]. For some of latter papers, we include English summaries provided by authors below.

The meeting was a third one with similar scopes (See Kôkyûroku **1169**(2000) and **1286**(2002)) .

Here are the list of the original titles of the talks as given at the meeting [2]:

Yamamoto, T. (Waseda University)
Harmonic relations between Green's functions and Green's matrices for boundary value problems III

Aguchi, S., Yamamoto, T. (Waseda University)
Fast and accurate solver for two-point bounary value problems

Sakakibara, S. (SIE. Dendai)
Continued fractions and fractional derivative viscoelasticity

Fujimoto, M. (Fukuoka University of Education), Suzuki, M. & Yokoyama, K. (Kyushu University)
On the Abhyankar's question for affine plane curves with one place at infinity

Mori, T. (Kyoto Sangyo University)
Fine-continuous Function and Computable Analysis

Masumoto, G. (Kyoto Sangyo University)
*The Lambda Game System: an approach to a meta-game

Yoshida, S. (JAIST)
The completion of the space $D(R)$ in constructive analysis

Tsuiki, H. (Kyoto University)
Representation on a topological space as bottomed sequences

[1] For these, * is placed in front of the titles below.
[2] Some of the papers contained in this Kôkyûroku are presented in altered titles.

Vita, Luminita Simona (Canterbury University & JAIST)
Continuous functions on apartness spaces

Ishihara, H. (JAIST)
Constructive reverse mathematics

Yasugi, M. & Tsujii, Y. (Kyoto Sangyo University)
Computability on the continuum: around piecewise computable functions

Oishi, S. (Waseda University)
* Error free transformation of floating point numbers and its applications

Takayama, N. (Kobe University)
*Applications of Algorithms for D-modules to Numerical Analysis

Nakao, M.T. (Kyushu University), Plum, S. (Carlsruhe University) & Watanabe, Y. (Kyushu University)
*A computer assisted proof for solutions of the Orr-Sommerfeld problem

Akama, Y. (Tohoku University)
*Computational complexity of real numbers via *beta*-adic representation

Kimura, K. (Kobe University)
*Interpolation solves open questions in discrete integrable system

Sadahiro, T. (Kumamoto Pref. University)
*Numerical experiments on domino tiling

Yoshikawa, A. (Kyushu University)
Maple and wave-front trackings (an experiment)

Summaries in English:

Oishi,S.

Constructive reals can be identified with programs which calculate them. Thus, the addition, subtraction, multiplication and division between reals can be implemented exactly on computers. If rational arithmetic based on integer array is used for implementation of such exact arithmetic, computational cost is too much to treat realistic applications. In this note, we propose to use floating point arithmetic for exact arithmetic. We shall show that the inner product of vectors whose component are floating point numbers can be calculated up to desired accuracy. Since the method only assumes IEEE 754 standard of floating point numbers, it is portable and efficient. Based on this method, in this note systems of linear simultaneous equations are treated. It is shown that they can be solved efficiently up to desired accuracy based on our accurate inner product calculation algorithm.

Nakao, M.T. et al.

In this article, we consider a computer assisted proof for solutions of the Orr-Sommerfeld equation which appears in fluid dynamics related to the two dimensional flow between infinite parallel plates. We numerically prove some properties in the stability analysis of the flow, which seem to be difficult to solve by existing theoretical approaches.

Akama, Y.

Computable real numbers and positional number systems with a computable irrational base: We effectively translate the rapidly converging Cauchy real numbers to the positional number representations with a computable irrational base, and vise versa. We give an effectively uniformly continuous, total, non-computable function from R to R which preserves every computable real numbers. The function is a counter example of Bridges' "Computability: A Mathematical Sketch book"

Sadahito,T.

Numerical experiments on random tilings: In this talk, We review results on local statistics of random lozenges tilings by Kenyon and show some numerical experimental results.

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Feasibility of Theoretical Arguments of Mathematical Analysis on Computer

研究集会報告集

２００３年９月１６日～９月１９日

研究代表者　吉川　敦 (Atsushi　Yoshikawa)

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